

CERTIFICATE

of Product Conformity (QAL1)

Certificate No.: 0000026912_05

Certified AMS: BAM 1020 PM_{2,5} with PM_{2,5} pre-separator for suspended particulate matter PM_{2,5}

Manufacturer: Met One Instruments Inc.
1600, Washington Blvd.
Grants Pass, Oregon 97526,
USA

Test Institute: TÜV Rheinland Energy & Environment GmbH

This is to certify that the AMS has been tested and found to comply with the standards VDI 4202-3 (2019), EN 14907 (2005), EN 16450 (2017), Guide for Demonstration of Equivalence of Ambient Air Monitoring Methods (2010), EN 15267-1 (2009) and EN 15267-2 (2009).

Certification is awarded in respect of the conditions stated in this certificate (this certificate contains 13 pages).
The present certificate replaces certificate 0000026912_04 dated 12 June 2019.



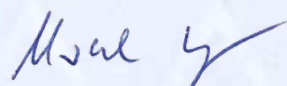
Suitability Tested
Complying with
2008/50/EC
EN 15267
Regular
Surveillance
www.tuv.com
ID 0000026912

Publication in the German Federal Gazette
(BAnz) of 28 July 2010

German Environment Agency
Dessau, 20 March 2024

This certificate will expire on:
25 March 2029

TÜV Rheinland Energy &
Environment GmbH
Cologne, 13 March 2024



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51105 Köln

Test institute accredited to EN ISO/IEC 17025 by DAkkS (German Accreditation Body).
This accreditation is limited to the accreditation scope defined in the enclosure to the certificate D-PL-11120-02-00.

Test report:	936/21209919/A dated 26 March 2010 Addendum No. 936/21243375/A dated 21 September 2018
Initial certification:	2 August 2010
Expiry date:	25 March 2029
Certificate:	Renewal (of previous certificate 0000026912_04 of 12 June 2019 valid until 25 March 2024)
Publication:	BAnz. 28 July 2010, No. 111, p. 2597, chapter II No. 1.1 and BAnz AT 26.03.2019 B7, chapter IV number 43

Approved application

The tested AMS is suitable for continuous ambient air monitoring of suspended particulate matter, PM_{2.5} fraction (stationary operation).

The suitability of the AMS for these applications was assessed based on a laboratory test and a field test performed at four different sites with different periods.

The AMS is approved for an ambient temperature range of +5 °C to 40 °C.

The notification of suitability of the AMS, performance testing and the uncertainty calculation have been effected on the basis of the regulations applicable at the time of testing. As changes in legal provisions are possible, any potential user should ensure that this AMS is suitable for monitoring the measured values relevant to the application.

Any potential user should ensure, in consultation with the manufacturer, that this AMS is suitable for the intended use.

Basis of the certification

This certification is based on:

- Test report 936/21209919/A dated 26 March 2010 of TÜV Rheinland Immissionsschutz und Energiesysteme GmbH and Addendum No. 936/21243375/A dated 21 September 2018 of TÜV Rheinland Energy GmbH
- Suitability announced by the German Federal Environment Agency (UBA) as the relevant body
- The ongoing surveillance of the product and the manufacturing process

Publication in the German Federal Gazette: BAnz. 28 July 2010, No. 111, p. 2597,
chapter II No. 1.1, Announcement by UBA dated 12 July 2010:

AMS designation:

BAM-1020 with PM_{2,5} pre-separator

Manufacturer:

Met One Instruments Inc., Grants Pass, USA

Field of application:

For continuous monitoring of suspended particulate matter, PM_{2,5} fraction, in ambient air from stationary sources

Measuring ranges during the performance test:

Component	Certification range	Supplementary range	Unit
PM _{2,5}	0 - 1,000	-	µg/m ³

Software version:

Version 3236-07 5.0.10

Restrictions:

None

Notes:

1. The measuring system complies with the requirements of the guide to "Demonstration of Equivalence of Ambient Air Monitoring Methods" for the component PM_{2,5}.
2. For monitoring PM_{2,5}, the instrument must at least be equipped with the following: Sample heater (BX-830), PM₁₀ sampling head (BX-802), PM_{2,5} Sharp Cut Cyclone SCC (BX-807), combined temperature and pressure sensor (BX-596) or an ambient temperature sensor (BX-592).
3. During the performance test, the cycle time was 1 h, i.e. the filter was automatically changed once an hour. Every filter spot was sampled only once.
4. Sampling time in the cycle time is 42s.
5. The measuring system must be operated inside a lockable measurement container.
6. The measuring system must be calibrated on site at regular intervals by using the gravimetric PM_{2,5} reference method according to EN 14907.
7. Horiba Europe GmbH, 61440 Oberursel, offer an identical AMS under the brand name APDA-371 with PM_{2,5} pre-separator.

Test Institute:

TÜV Rheinland Immissionsschutz und Energiesysteme GmbH, Cologne
Report No.: 936/21209919/A dated 26 March 2010

Publication in the German Federal Gazette: BAnz. 26.01.2011, No. 14, p. 294,
Chapter IV, notification 18, Announcement by UBA dated 10 January 2011:

**18 Notification as regards Federal Environment Agency notice
of 12 July 2010 (BAnz. p. 2597, Chapter II, Number 1.1)**

After a re-assessment, the BAM-1020 measuring system with PM_{2,5} pre-separator manufactured by Met One Instruments meets the requirements for the leak tightness of the sampling system.

The measuring system also complies with the requirements of guideline "Demonstration of Equivalence of Ambient Air Monitoring Methods", version dated January 2010.

Statement issued by TÜV Rheinland Energie und Umwelt GmbH
dated 25 September 2010

Publication in the German Federal Gazette: BAnz. 29.07.2011, No. 113, p. 2725,
Chap. III, notification 11, Announcement by UBA dated 15 July 2011:

**11 Notification as regards Federal Environment Agency (UBA) notices
of 12 July 2010 (BAnz. p. 2597, Chapter II, Number 1.1) and
of 10 January 2011 (BAnz. p. 294, Chapter IV, notification 18)**

The BAM-1020 measuring system with PM_{2,5} pre-separator manufactured by Met One Instruments, Inc. measuring suspended particulate matter PM_{2,5} may also be operated with a BX-125 pump.
The measuring system may optionally be equipped with a touch screen display (BX-970 option).

The current software version is:
3236-77 V5.1.0

The software version of the measuring system without the BX-970 touch screen option remains unchanged: 3236-07 5.0.10.

Statement issued by TÜV Rheinland Energie und Umwelt GmbH
dated 24 March 2011

Publication in the German Federal Gazette: BAnz AT 20.07.2012 B11, Chap. IV notification 5, Announcement by UBA dated 06 July 2012:

5 Notification as regards Federal Environment Agency (UBA) notices of 12 July 2010 (BAnz. p. 2597, Chapter II, Number 1.1) and of 15 July 2011 (BAnz. p. 2725, Chapter III, notification 11)

The BAM-1020 measuring system with PM_{2,5} pre-separator manufactured by Met One Instruments, Inc. measuring suspended particulate matter PM_{2,5} was equipped with a re-designed back plate, which makes room for additional interfaces such as the optional BX-965 reporting process.

The current software version of the measuring system is:
3236-07 5.0.15

The current software version of the measuring system with the touch screen display (option BX-970) is:
3236-77 V5.1.2

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 21 March 2012

Publication in the German Federal Gazette: BAnz AT 23.07.2013 B4, Chap. V notification 4, Announcement by UBA dated 03 July 2013:

4 Notification as regards Federal Environment Agency (UBA) notices of 12 July 2010 (BAnz. p. 2597, Chapter II, Number 1.1) and of 6 July 2012 (BAnz AT 20.07.2012 B11, chapter IV notification 5)

The current software version of the BAM-1020 measuring system with PM_{2,5} pre-separator manufactured by Met One Instruments, Inc. monitoring suspended particulate matter PM_{2,5} is:

3236-07 5.1.1

The current software version of the measuring system with the touch screen display (option BX-970) is:
3236-77 V5.2.0

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 18 March 2013

Publication in the German Federal Gazette BAnz AT 02.04.2015 B5, chapter IV notification 12, Announcement by UBA dated 25 February 2015:

12 Notification as regards Federal Environment Agency (UBA) notices of 12 July 2010 (BAnz. p. 2597, Chapter II, Number 1.1) and of 3 July 2013 (BAnz AT 23.07.2013 B4, chapter V notification 4)

The 970603 (MICROSWITCH #185PC15AT) pressure sensor integrated in the BAM 1020 measuring system with PM_{2.5} pre-separator manufactured by Met One Instruments, Inc. has been discontinued and replaced by a 970595 (HONEYWELL SSCDANN015PAAA5) pressure sensor.

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 20 September 2014

Publication in the German Federal Gazette: BAnz AT 26.03.2018 B8, Chap. V notification 9, Announcement by UBA dated 21 February 2018:

9 Notification as regards Federal Environment Agency (UBA) notices of 12 July 2010 (BAnz. p. 2597, Chapter II, Number 1.1) and of 25 February 2015 (BAnz AT 02.04.2015 B5, chapter IV, notification 12)

The current software version of the BAM-1020 measuring system with PM_{2.5} pre-separator manufactured by Met One Instruments, Inc. is:
3236-07 5.5.0

The current software version of the measuring system with the touch screen display (option BX-970) is:
3236-77 V5.2.0

Statement issued by TÜV Rheinland Energy GmbH dated 18 August 2017

Publication in the German Federal Gazette: BAnz AT 26.03.2019 B7, Chap. IV notification 43, Announcement by UBA dated 27 February 2019:

43 Notification as regards Federal Environment Agency (UBA) notices of 12 July 2010 (BAnz. p. 2597, Chapter II, number 1.1) of 21 February 2018 (BAnz AT 26.03.2018 B8, chapter V notification 9)

In its version without a touch screen display (option BX-970), the BAM-1020 measuring system with PM_{2,5} pre-separator manufactured by Met One Instruments, Inc. meets the requirements of standard EN 16450 (July 2017). An addendum to test report No. 936/21243375/A is available online at www.qal1.de.

The current software version is: 3236-05 3.14.2.

The current software version of the measuring system with the touch screen display (option BX-970) is: 3236-77 V5.2.0.

Statement issued by TÜV Rheinland Energy GmbH dated 10 January 2019.

Publication in the German Federal Gazette: BAnz AT 03.05.2021 B9, Chap. III notification 43, Announcement by UBA dated 31 March 2021:

43 Notification as regards Federal Environment Agency (UBA) notices of 12 July 2010 (BAnz. p. 2597, chapter II number 1.1) and of 27 February 2019 (BAnz AT 26.03.2019 B7, chapter IV notification 43)

The latest software version of the BAM-1020 measuring system for suspended particulate matter PM_{2,5} manufactured by Met One Instruments, Inc. is:
3236-05 V3.14.3

The latest software version of the measuring system with the touch screen display (option BX-970) is unchanged:

3236-77 V5.2.0.

Statement issued by TÜV Rheinland Energy GmbH dated 10 June 2020

Publication in the German Federal Gazette: BAnz AT 11.04.2022 B10, Chap. VI notification 18, Announcement by UBA dated 09 March 2022:

18 Notification as regards Federal Environment Agency (UBA) notices of 12 July 2010 (BAnz. p. 2597, chapter II number 1.1) and of 31 March 2021 (BAnz AT 03.05.2021 B9, chapter III notification 43)

The current software version of the measuring device BAM-1020 for suspended particulate matter PM_{2,5} of the company Met One Instruments, Inc. is:
R9.3.0

In the future, the measuring device will basically have a touch-sensitive screen and an USB port will now be installed in the front panel. On the rear panel there is now an electrical connection for a new generation of digital frahling sensors.

In this context, the previous temperature sensor (BX-592) will be replaced with the digital model BX-598, and the combined pressure and temperature sensor BX-596 will be replaced with the digital model BX-597A, which also measures humidity.

Statement issued by TÜV Rheinland Energy GmbH dated 08 December 2021

Publication in the German Federal Gazette: BAnz AT 20.03.2023 B6, chapter IV notification 79, Announcement by UBA dated 21 February 2023:

79 Notification as regards Federal Environment Agency (UBA) notices of 12 July 2010 (BAnz. p. 2597, chapter II number 1.1) and of 9 March 2022 (BAnz AT 11.04.2022 B10, chapter IV notification 18)

The current software versions of the BAM-1020 measuring system for suspended particulate matter PM_{2,5} from the company Met One Instruments, Inc. are:

Version without touch-sensitive screen 3236-05 3.14.4.

Version with touch-sensitive screen (old screen version) 3236-77 V5.2.0.

Version with touch-sensitive screen (new screen version) R9.5.1

Statement issued by TÜV Rheinland Energy GmbH dated 08 September 2022

Certified product

This certificate applies to automated measurement systems conforming to the following description:

The ambient air quality measuring system BAM-1020 uses beta-attenuation as its measurement principle.

The BAM-1020 measuring system with PM_{2,5} pre-separator consists of the PM₁₀-sampling inlet BX-802, PM_{2,5} Sharp Cut Cyclone SCC BX-807, the sampling tube, the sample heater BX-830, the ambient temperature sensor BX-596 or, alternatively, the BX-592 ambient temperature sensor, the BX-127 (or optional BX-125) instrument vacuum pump, the BAM-1020 measuring instrument as such (incl. glass-fibre filter tape), the respective connecting tubes and lines as well as adapters, the roof flange as well as the manual in German.

The particle sample passes the PM₁₀-sampling inlet and the PM_{2,5} Sharp Cut Cyclone SCC at a flow rate of 1 m³/h and reaches the BAM-1020 analyser via the sampling tube.

During performance testing, the measuring system was operated with the BX-830 sample heater.

The radiometric determination of mass is calibrated in the factory and is checked hourly during operation as part of internal quality assurance at the zero point (clean filter spot) and at the span point (built-in reference foil). Measured values at zero and span points are easily derived from the data generated. These can then be compared to stability criteria (drift) or target values for span (factory settings).

A measurement cycle (incl. automatic checking of radiometric measurement) proceeds as follows (setting for PM_{2,5}: radiometric measuring time: 8min):

1. At the beginning of each cycle, initial and blank measurements are performed with a clean filter tape I₀. This takes 8 min.
2. The filter tape is transported forward over a distance of 4 dust spots and pushed under the sampling point. The sample is taken from the filter spot where I₀ was previously determined. For a sampling duration of 42 min. particulate-loaded air is then sucked through that filter spot.
3. At the same time, the spot 4 positions upstream on the filter band is submitted to radiometric measurement I₁ for a duration of 8 minutes. This measurement is performed to check for potential drift effects caused by changes in external parameters such as temperature or relative moisture. The same spot is subjected to a third radiometric measurement I₂ with an inserted reference foil. The same spot of the filter tape is subjected to yet another I_{1x}, eight minutes before the end of the collection time in order to monitor stability of the zero point with the help of I₁ and I_{1x}.
4. Once sampling has been completed, the filter band is reversed back four sampling spots and the sampled filter spot is measured radiometrically (I₃). The calculation of the concentration completes the measurement cycle.
5. The next cycle will start again with step 1.

The BAM 1020 with PM_{2,5} pre-separator has already been performance tested and publically announced as such. The instrument version certified here is equipped with a PM_{2,5} pre-separator.

General notes

This certificate is based upon the equipment tested. The manufacturer is responsible for ensuring that on-going production complies with the requirements of the EN 15267. The manufacturer is required to maintain an approved quality management system controlling the manufacture of the certified product. Both the product and the quality management systems shall be subject to regular surveillance.

If a product of the current production does not conform to the certified product, TÜV Rheinland Energy & Environment GmbH must be notified at the address given on page 1.

A certification mark with an ID-Number that is specific to the certified product is presented on page 1 of this certificate. This certification mark may be applied to the product or used in advertising materials for the certified product.

This document as well as the certification mark remains property of TÜV Rheinland Energy & Environment GmbH. With revocation of the publication the certificate loses its validity. After the expiration of the certificate and on requests of the TÜV Rheinland Energy & Environment GmbH this document shall be returned and the certificate mark must not be employed anymore.

The relevant version of this certificate and its expiration is also accessible on the internet: gal1.de.

History of documents

Certification of BAM 1020 PM_{2,5} with PM_{2,5}-pre separator is based on the documents listed below and the regular, continuous monitoring of the Quality Management System of the manufacturer:

Initial certification according to EN 15267

Certificate No. 0000026912_00: 02 August 2010
Expiry date of the certificate: 01 August 2015
Test report: 936/21209919/A dated 26 March 2010
TÜV Rheinland Immissionsschutz und Energiesysteme GmbH
Publication: BAnz. 28 July 2010, No. 111, p. 2597, chapter II number 1.1
UBA announcement dated 12 July 2010

Certificate based on a notification

Certificate No. 0000026912_01: 19 August 2011
Expiry date of the certificate: 01 August 2015
Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 25 September 2010
Publication: BAnz. 26 January 2011, No. 14, p. 294, chapter IV number 18
UBA announcement dated 10 January 2011
(Re-assessment of requirements)

Certificate based on a notification

Certificate No. 0000026912_02: 16 March 2012
Expiry date of the certificate: 01 August 2015
Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 24 March 2011
Publication: BAnz. 29 July 2011, No. 113, p. 2725, chapter III number 11
UBA announcement dated 15 July 2011
(Optional touch screen display)

Notifications

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 21 March 2012
Publication: BAnz AT 20.07.2012 B11, chapter IV notification 5
UBA announcement dated 6 July 2012
(Soft- and hardware changes)

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 18 March 2013
Publication: BAnz AT 23.07.2013 B4, chapter V notification 4
UBA announcement dated 3 July 2013
(New software version)

Statement issued by TÜV Rheinland Energie und Umwelt GmbH dated 20 September 2014
Publication: BAnz AT 02.04.2015 B5, chapter IV notification 12
UBA announcement dated 25 February 2015
(New pressure sensor)

Renewal of certificate

Certificate No. 0000026912_03: 28 July 2015
Expiry date of the certificate: 01 August 2020

Notifications

Statement issued by TÜV Rheinland Energy GmbH dated 18 August 2017
Publication: BAnz AT 26.03.2018 B8, chapter V notification 9
UBA announcement dated 21 February 2018
(Software changes)

Certificate based on a notification

Certificate No. 0000026912_04: 12 June 2019
Expiry date of the certificate: 25 March 2024
Statement issued by TÜV Rheinland Energy GmbH dated 10 January 2019
Test report: 936/21243375/A dated 21 September 2018
Publication: BAnz AT 26.03.2019 B7, chapter IV notification 43
UBA announcement dated 27 February 2019
(Fulfillment of requirements according to EN 16450)

Notifications

Statement issued by TÜV Rheinland Energy GmbH dated 10 June 2020
Publication: BAnz AT 03.05.2021 B9, chapter III notification 43
UBA announcement dated 31 March 2021
(Software changes)

Statement issued by TÜV Rheinland Energy GmbH dated 8 December 2021
Publication: BAnz AT 11.04.2022 B10, chapter VI notification 18
UBA announcement dated 9 March 2022
(Soft- and hardware changes)

Statement issued by TÜV Rheinland Energy GmbH dated 8 September 2022
Publication: BAnz AT 20.03.2023 B6, chapter IV notification 79
UBA announcement dated 21 February 2023
(Software changes)

Renewal of certificate

Certificate No. 0000026912_05: 20 March 2024
Expiry date of the certificate: 25 March 2029

Expanded uncertainty PM_{2,5}

Comparison candidate with reference according to Standard EN 16450:2017				
Candidate	BAM-1020	SN	SN 17010 & SN 17011	
Status of measured values	Offset corrected	Limit value	30	µg/m³
		Allowed uncertainty	25	%
All comparisons				
Uncertainty between Reference	0,33			µg/m³
Uncertainty between Candidates	1,38			µg/m³
SN 17010 & SN 17011				
Number of data pairs	248			
Slope b	1,000			not significant
Uncertainty of b	0,012			
Ordinate intercept a	0,000			not significant
Uncertainty of a	0,204			
Expanded meas. uncertainty W _{CM}	11,67			%
All comparisons, ≥18 µg/m³				
Uncertainty between Reference	0,30			µg/m³
Uncertainty between Candidates	1,57			µg/m³
SN 17010 & SN 17011				
Number of data pairs	74			
Slope b	1,031			
Uncertainty of b	0,033			
Ordinate intercept a	-0,832			
Uncertainty of a	0,919			
Expanded meas. uncertainty W _{CM}	15,00			%
All comparisons, <18 µg/m³				
Uncertainty between Reference	0,34			µg/m³
Uncertainty between Candidates	1,05			µg/m³
SN 17010 & SN 17011				
Number of data pairs	174			
Slope b	0,971			
Uncertainty of b	0,025			
Ordinate intercept a	0,302			
Uncertainty of a	0,267			
Expanded meas. uncertainty W _{CM}	10,64			%

Comparison candidate with reference according to Standard EN 16450:2017				
Candidate	BAM-1020	SN	SN 17010 & SN 17011	
Status of measured values	Offset corrected	Limit value	30	µg/m³
		Allowed uncertainty	25	%
Teddington, Summer				
Uncertainty between Reference	0,33	µg/m³		
Uncertainty between Candidates	1,13	µg/m³		
	SN 17010		SN 17011	
Number of data pairs	78		78	
Slope b	0,994		1,016	
Uncertainty of b	0,030		0,025	
Ordinate intercept a	1,058		0,254	
Uncertainty of a	0,372		0,308	
Expanded meas. uncertainty W_{CM}	14,54	%	11,95	%
Cologne, Winter				
Uncertainty between Reference	0,39	µg/m³		
Uncertainty between Candidates	1,76	µg/m³		
	SN 17010		SN 17011	
Number of data pairs	75		75	
Slope b	0,980		1,061	
Uncertainty of b	0,024		0,019	
Ordinate intercept a	0,196		-0,334	
Uncertainty of a	0,512		0,405	
Expanded meas. uncertainty W_{CM}	13,08	%	14,12	%
Bornheim, Summer				
Uncertainty between Reference	0,30	µg/m³		
Uncertainty between Candidates	1,13	µg/m³		
	SN 17010		SN 17011	
Number of data pairs	53		57	
Slope b	1,052		1,134	
Uncertainty of b	0,036		0,048	
Ordinate intercept a	-1,726		-2,262	
Uncertainty of a	0,527		0,727	
Expanded meas. uncertainty W_{CM}	11,17	%	20,77	%
Teddington, Winter				
Uncertainty between Reference	0,27	µg/m³		
Uncertainty between Candidates	1,01	µg/m³		
	SN 17010		SN 17011	
Number of data pairs	45		43	
Slope b	0,970		0,991	
Uncertainty of b	0,014		0,014	
Ordinate intercept a	-0,946		-0,134	
Uncertainty of a	0,300		0,293	
Expanded meas. uncertainty W_{CM}	14,46	%	7,70	%
All comparisons, ≥18 µg/m³				
Uncertainty between Reference	0,30	µg/m³		
Uncertainty between Candidates	1,57	µg/m³		
	SN 17010		SN 17011	
Number of data pairs	76		75	
Slope b	0,984		1,092	
Uncertainty of b	0,035		0,034	
Ordinate intercept a	-0,180		-1,872	
Uncertainty of a	0,975		0,95	
Expanded meas. uncertainty W_{CM}	16,73	%	16,73	%
All comparisons, <18 µg/m³				
Uncertainty between Reference	0,34	µg/m³		
Uncertainty between Candidates	1,05	µg/m³		
	SN 17010		SN 17011	
Number of data pairs	175		178	
Slope b	0,955		1,021	
Uncertainty of b	0,028		0,026	
Ordinate intercept a	0,373		-0,130	
Uncertainty of a	0,306		0,286	
Expanded meas. uncertainty W_{CM}	13,31	%	11,22	%
All comparisons				
Uncertainty between Reference	0,33	µg/m³		
Uncertainty between Candidates	1,38	µg/m³		
	SN 17010		SN 17011	
Number of data pairs	251		253	
Slope b	0,969	significant	1,041	significant
Uncertainty of b	0,013		0,012	
Ordinate intercept a	0,225	not significant	-0,387	not significant
Uncertainty of a	0,226		0,214	
Expanded meas. uncertainty W_{CM}	13,87	%	13,61	%